Drain Water Heat Recovery: On the Road to Becoming a Mainstream Water Heating Technology

by Gerald Van Decker, M.A.Sc., P.Eng.

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Corporate Background

- In business since 2000
- 19 employees
- Many successful energy saving projects deployed
- Over 90% of Market in Drain Water Heat Recovery
- Ongoing sales to Canada, USA, and Europe
- Offices:
  - Kitchener, Ontario
  - Hazelton, Penn

What will be Covered in this Presentation

- Drain Water Heat Recovery: Definition, Opportunities and Benefits
- Falling Film Heat Exchangers: Why this class of technology is the most common used for Drain Water Heat Recovery Various proven applications
- Application: Residential, Commercial, Industrial
- Market Challenges – A Technology Stuck between Rating Systems
  - EnergyStar labeling program
  - "Combined Energy Factor for Water Heating”
- Sampling of Various Programs and Energy Performance Building Code Recognition

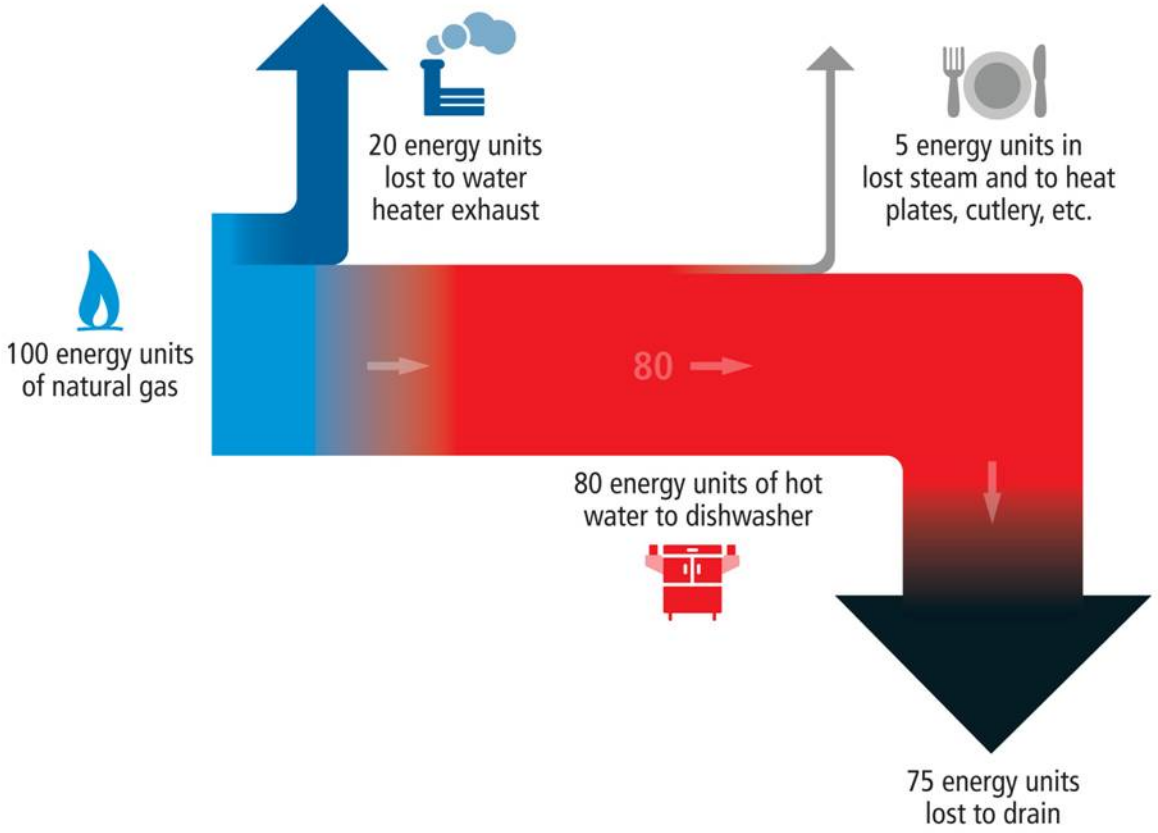
Drain Water Heat Recovery: Definition, Opportunities and Benefits

The Energy Resource

- Definition of DWHR: the process of using outgoing warm drain water to pre-heat incoming cold fresh water
- Heat energy in drain water in most buildings is a huge untapped resource
- This heat energy can be safely and cost effectively recovered with Drain Water Heat Recovery (DWHR) technology
- Main Benefit: the energy saved by reducing the primary water heating energy load

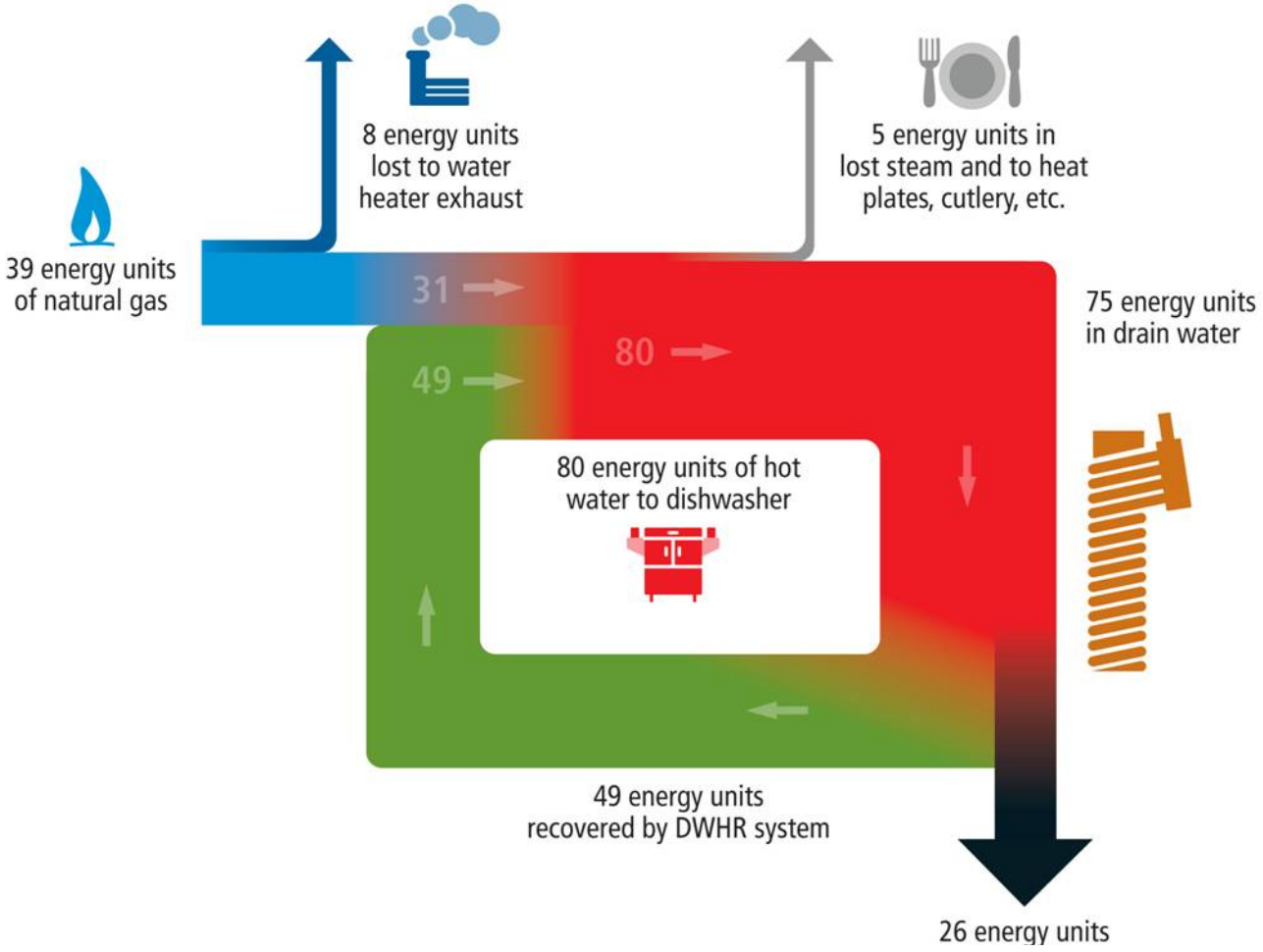
Energy Flow Diagram - Example of a restaurant

- Without DWHR



Energy Flow Diagram - Example of a restaurant

- With DWHR



Other Benefits of Drain Water Heat Recovery

- Cost-effective technology for both new construction and renovation
- Increased effective hot water capacity (reduce primary size) and/or
- Increased life of primary water heater(s)
- Low cost technology for green building program certification (e.g. LEED)
- Specification/design of systems is easily repeated and transferred to other projects
- Technology easily understood and installed

Falling Film Heat Exchangers

Standard Liquid to Liquid Heat Exchangers

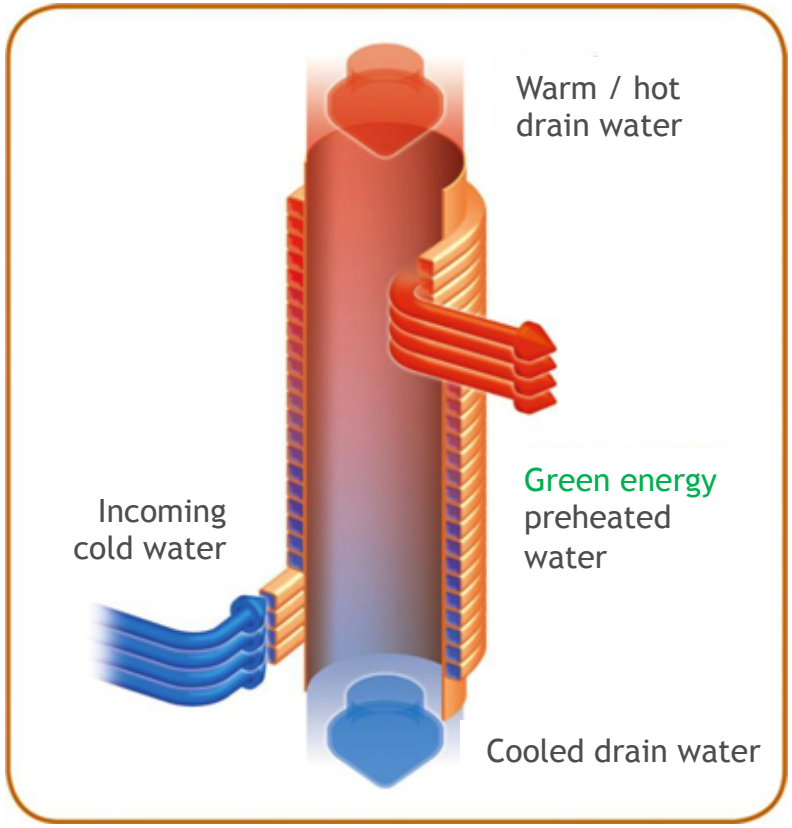
- “Plate and Frame” and “Tube-in-Shell” are the most common types of Heat Exchangers for Liquid to Liquid heat transfer
- They work very well when both liquids are clean
- They cannot pass large solids and tend foul quickly with dirty liquid
- They are not double-walled and vented, therefore cannot be used for potable water with DWHR

Plate and frame heat exchanger

Tube-in-shell heat exchanger

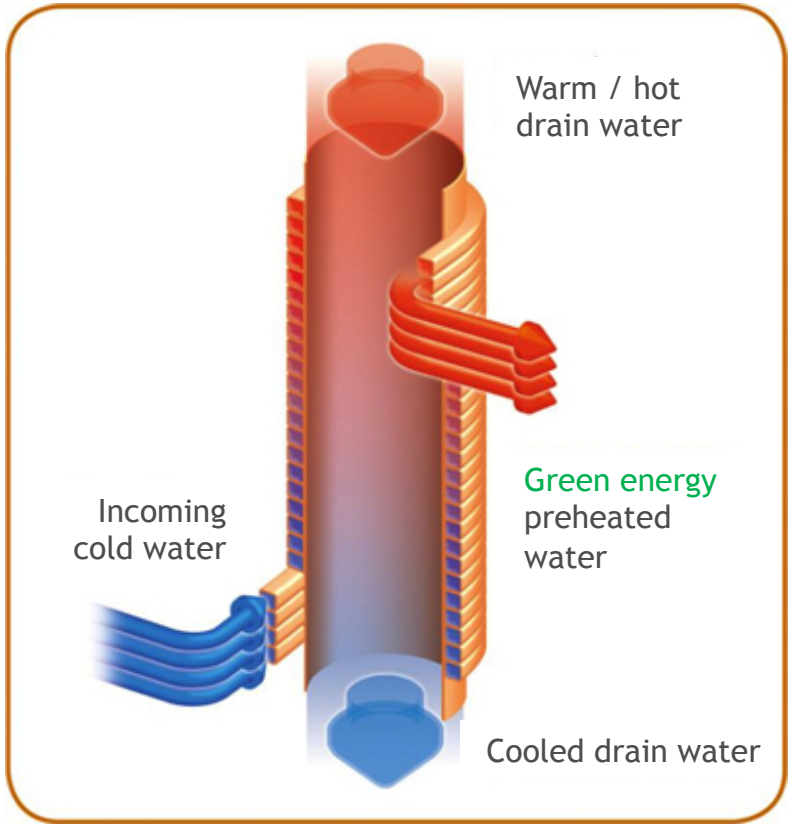
Falling Film Heat Exchangers

- The center section in which warm drain liquid flows through is an open pipe which can easily pass large solids
- They rely on a principle caused by surface tension: as drain water falls through the center section, it clings to the inner wall
- high-efficiency, non-fouling and maintenance-free
- Made of standard, accepted plumbing parts



Falling Film Heat Exchangers

- Facts:
  - Heat transfer efficiency is not highly dependent upon contact time
  - Heat transfer efficiency is more dependent upon intimate contact between the fluid and the wall
- Drain water speeds up as it falls:
  - Forming a very thin, turbulent film
  - <1 millimeter thick
- Result:
  - Drain water film imparts its heat to the fresh water through the pipe wall



DWHR – Technology Design Considerations

1- Potable Water Safety

- unit must be double-walled and vented
- two walls of separation between dirty drain water and fresh water

2- Water Pressure Loss

- minimize pressure loss so it does not cause fresh water flow problems

3- Counter-Flow

- two fluids flowing in opposite directions
- maximize efficiency

DWHR – Technology Design Considerations

4- Efficient and Low Maintenance

- Excellent contact between the two walls
- long service life, maintenance-free, do not foul over time

5- Variety of Sizes

- Drain diameters: 2in, 3in, 4in or 6in
- Drain lengths: 2ft to 10ft, increment of 6in
- Freshwater connection: ¾in or 1in
- Multi-pipe DWHR systems
  - Consist of 2 or more individual units
  - Recover heat from flows of up to 1000gpm

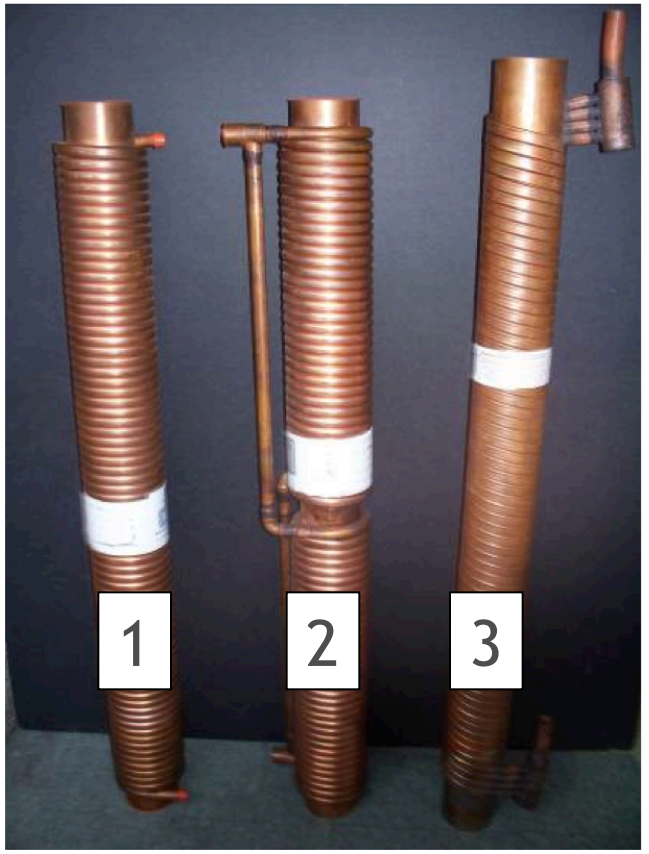
Sizing a DWHR Unit

- Many sizes available to fit many applications
- DWHR unit diameter should match existing drain pipe
- Normally specify longest DWHR unit that can fit in the vertical space
- High-flow applications may require multi-pipe drain water heat recovery units
  - Typically size for 5 to 10 usgpm per single unit
  - Contact the manufacturer or licensed Distributor for assistance

Three Generations of DWHR Design

First Generation

- single coil, ½in nominal, arranged on inner drain pipe
- good efficiency if made well because the are “counter-flow” so max efficiency is 100%
- high pressure loss in the freshwater supply line - which can lead to fresh water flow problems at times



Three Generations of DWHR Design

Second Generation

- two or more fresh water coils arranged on inner drain pipe and connect in parallel
- low pressure loss
- Is not a “counter-flow” heat exchanger, resulting in **lower** efficiency:
  - Max Achievable of 75% for 2 coils and even less for more coils

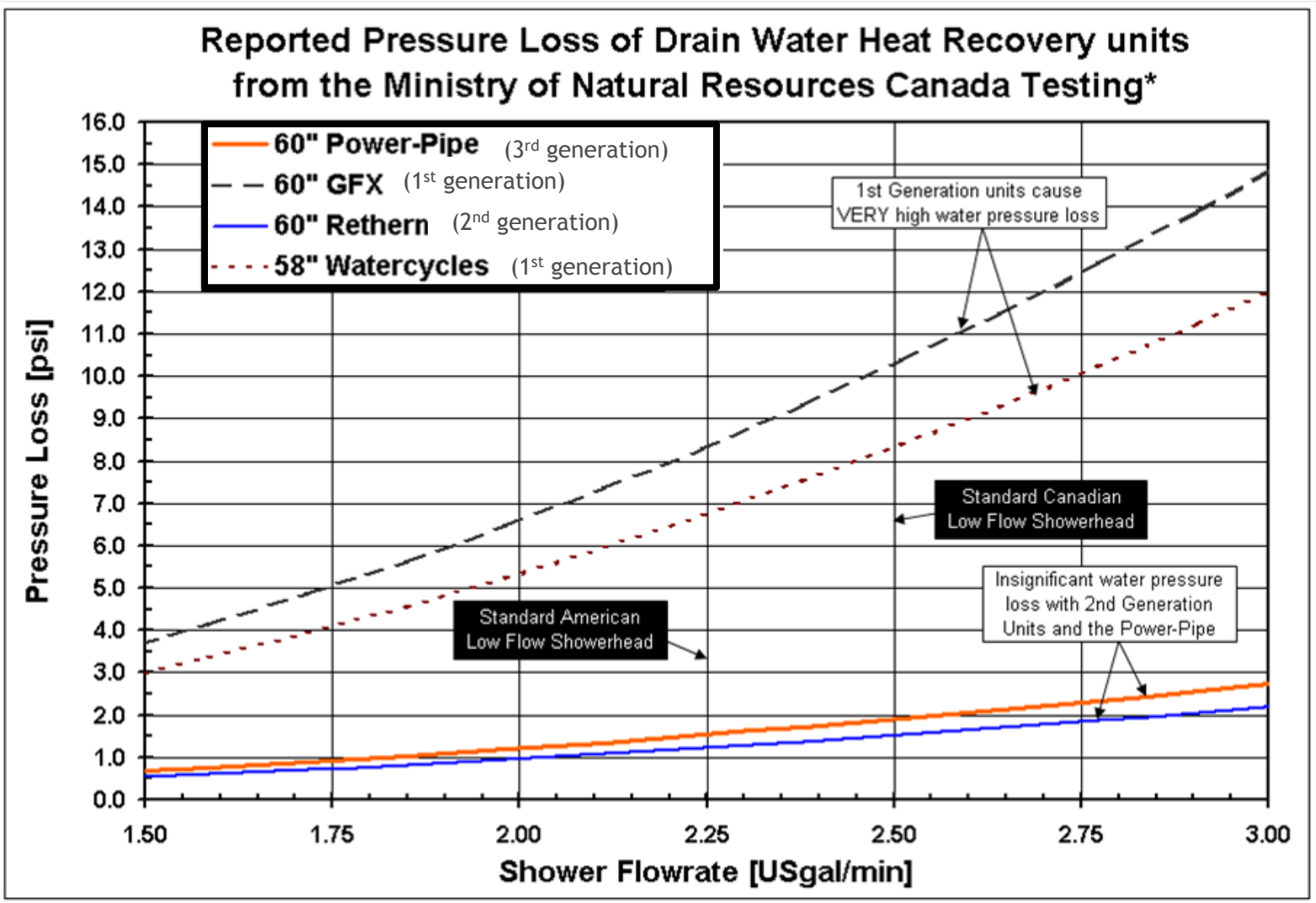
Three Generations of DWHR Design

Third Generation

- multiple coils arranged in parallel on inner drain pipe
- “counter-flow” so max efficiency is 100%
- highest efficiency
- very low pressure loss
- optimized model designs for residential and commercial applications
- patented and patents pending

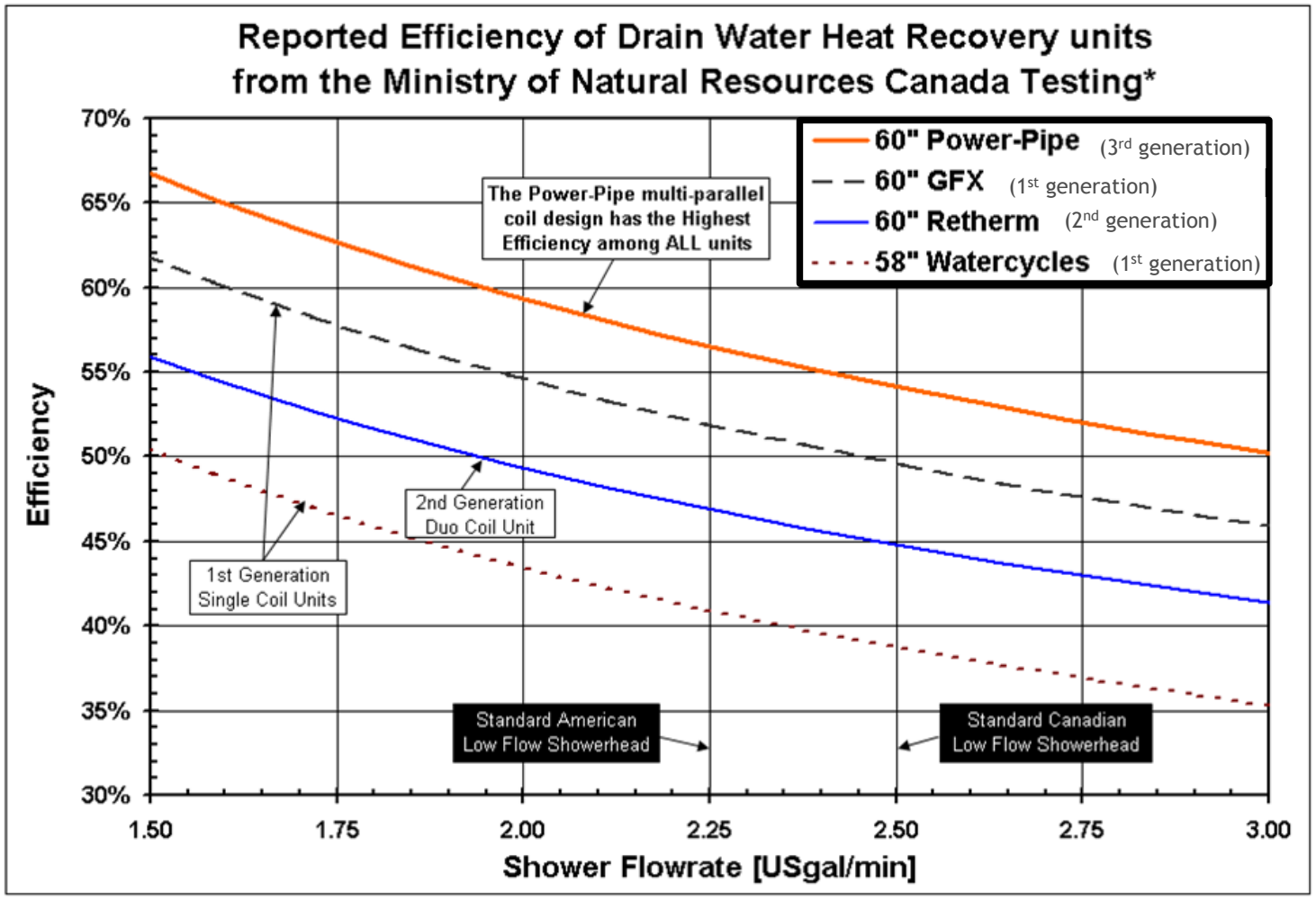
Comparison of the 3 generations of DWHR

A) Pressure loss according to NRCan Study (2007)



Comparison of the 3 generations of DWHR

B) Efficiency according to NRCan Study (2007)



Applications

Hot Water Energy Savings Technology Comparisons

	Cost/Energy Reduction	Return on Investment
RESIDENTIAL		
• Low Flow Showerheads	20-27%	>100%
• DWHR with eff of 53.7% (e.g. R3-60)	25-35%	10-50%
• Standard On-Demand (tankless)	8-16%*	3-12%
• Solar Water Heating (freeze protected)	35-55%	0.1-3%
*NOTE: The California State Energy Commission de-rates the EF of On-Demand Water Heaters with a factor of 0.92		
MULTI-UNIT RESIDENTIAL		
• DWHR with eff of 55.7% (e.g. C4-72)	25-30%	20-40%
• Solar Water Heating (freeze protected)	10-50%	3-10%
INDUSTRIAL		
• DWHR Multi-Pipe System	40-60%	50-300%
• Other Heat Exchangers	5-20%	30-400%

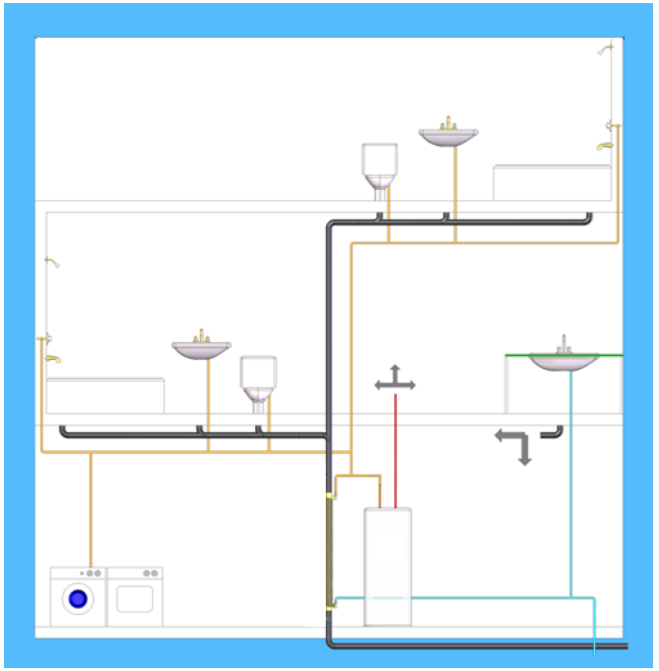
DWHR can provide:

▪High % savings impact
▪Excellent Return on Investment,
▪Long Maintenance-Free Operation, and
▪NO negative impact on lifestyle (or process for industrial)

Typical Residential Installation

- divert entire freshwater supply through DWHR unit immediately after it passes through water meter or water softener

- May feed the kitchen sink with cold water upstream of DWHR, but not necessary

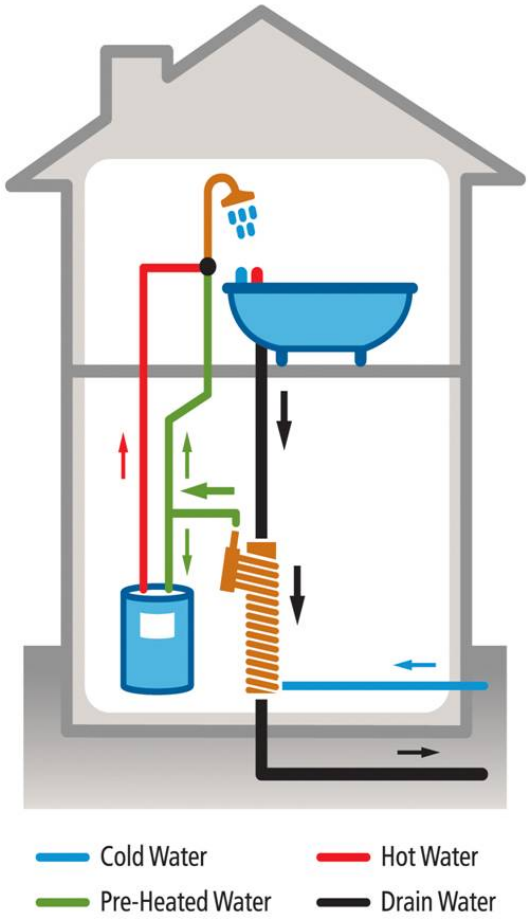


Building Type	Design Variation	Plumbing Configuration / Comments	Typical Hot Water Energy Load (% of total) A	Typical Reduction in Hot Water Load B	Typical Potential Savings of Total Energy Load (% of total) A*B	Typical LEED Points Achievable in IECC Climate Zones 6-8 - North	Typical LEED Points Achievable in IECC Climate Zones 1-5 - South
Homes - Detached	1-2 Washrooms (WC) in home	Equal Flow	20.0%	35.0%	7.0%	7.4	7.6
		CW or HW Pre-Heating Only		26.3%	5.3%	6.0	6.1
Homes - Attached		Equal Flow	21.3%	35.0%	7.5%	7.7	8.0
		CW or HW Pre-Heating Only		26.3%	5.6%	6.3	6.4

Please NOTE: The LEED Points listed here are subject to project specific approval and are provided for illustration purposes only

Equal Flow – Slab-on-grade

- if the shower is on the second floor install drain water heat recovery unit in wall of main floor



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Homes - Detached	1-2 Washrooms (WC) in home	20.0%	35.0%	7.0%	7.4	7.6
Homes - Attached		21.3%	35.0%	7.5%	7.7	8.0

Please NOTE: The LEED Points listed here are subject to project specific approval and are provided for illustration purposes only

Retrofitting a Home

- DWHR unit to be installed in a home
  - ¾in. cold water line
  - 3in. Black ABS drain pipe
  - equal flow configuration

1. cut in the main cold water line

Retrofitting a Home

2. extend the freshwater water line to and from the location of the DWHR

3. cut the bottom of the existing drain pipe 4 in up from the bottom cleanout fitting

Retrofitting a Home

4. measure the vertical distance equal to the length of the DWHR unit along the drain pipe.

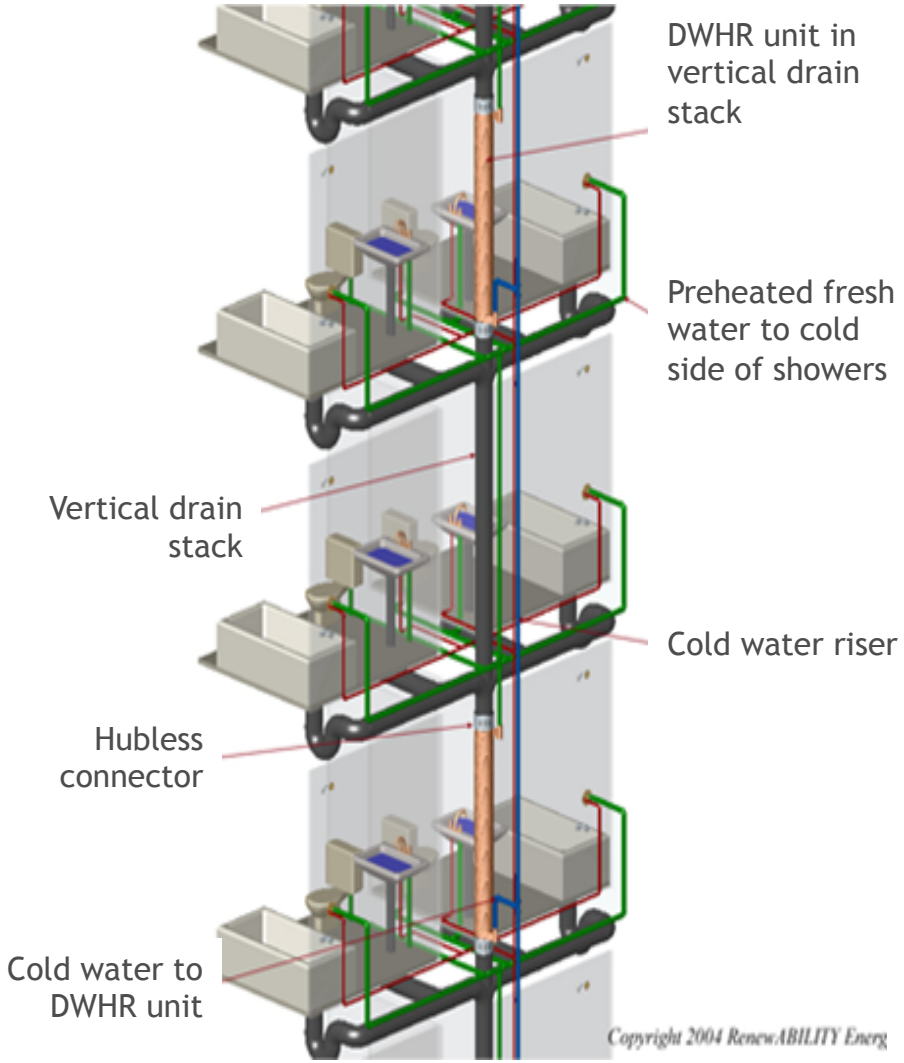
5. cut the drain pipe at marks

Retrofitting a Home

5. install DWHR unit and connect the freshwater line:
- the supply line to the bottom of the DWHR
- the return line to the top of the DWHR unit

DWHR for Multi-Residential

- Multi-Residential and lodging :
  - Central water heating system with recirculation loop
- Most common design:
  - Install DWHR units throughout the building
  - Preheat the cold water for up to 6 washrooms
- Good trade-off between performance and cost



4 Washrooms per DWHR Unit

- Financial Analysis

Application (Building Type)	Variation	Plumbing Configuration / Comments	Typical Hot Water Energy Load (% of total)	Typical Reduction in Hot Water Load	Typical Potential Savings of Total Energy Load (% of total)	Typical LEED Points Achievable for High-Rise (NC and Major Retrofit) Multi-Residential	Typical LEED Points Achievable for Mid-Rise (HMR) Multi-Residential	Budgetary Total Cost Per Housing Unit
Multi-Res (2-4 apart's) w/ Central Water Heating	1-2 WC per DWHR Unit	CW Pre-Heating Only	18.4%	29.4%	5.4%	[redacted]	5.4	$580.00
	3-4 WC per DWHR Unit	**CW Pre-Heating Only**		**23.5%**	**4.3%**	[redacted]	**4.3**	**$310.00**
Multi-Res (>= 5 apart's) w/ Central Water Heating	1-2 WC per DWHR Unit	CW Pre-Heating Only	22.4%	29.4%	6.6%	3.3	6.6	$530.00
	3-4 WC per DWHR Unit	**CW Pre-Heating Only**		**23.5%**	**5.3%**	**2.6**	**5.3**	**$310.00**
	5-6 WC per DWHR Unit	CW Pre-Heating with 1.5gpm Showerheads		16.7%	3.7%	1.9	3.7	$230.00
	>=7 WC per DWHR Unit	recirc. loop / custom engineered		4.1%	0.9%	0.5	0.9	custom
Multi-Res (>= 5 apart's) w/ Individual Water Heating	1-2 WC per DWHR Unit	Equal Flow	22.4%	38.8%	8.7%	4.3	8.7	$580.00
	3-4 WC per DWHR Unit	Equal Flow with 1.5gpm Showerheads		29.8%	6.7%	3.3	6.7	$350.00
	5-6 WC per DWHR Unit	Equal Flow with 1.5gpm Showerheads		24.8%	5.6%	2.8	5.6	$260.00
Lodging (dorms, hotels, etc.) / always Central Water Heating	1-2 WC per DWHR Unit	CW Pre-Heating Only	31.4%	29.4%	9.2%	4.6	9.2	$530.00
	3-4 WC per DWHR Unit	**CW Pre-Heating Only**		**23.5%**	**7.4%**	**3.7**	**7.4**	**$310.00**
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	>=7 WC per DWHR Unit	recirc. loop / custom engineered		4.1%	1.3%	0.6	1.3	custom

Typical Energy Savings: 4% to 7%

Typical Budgetary Cost: $310 per suite

Typical Payback Range: 3 to 4 years

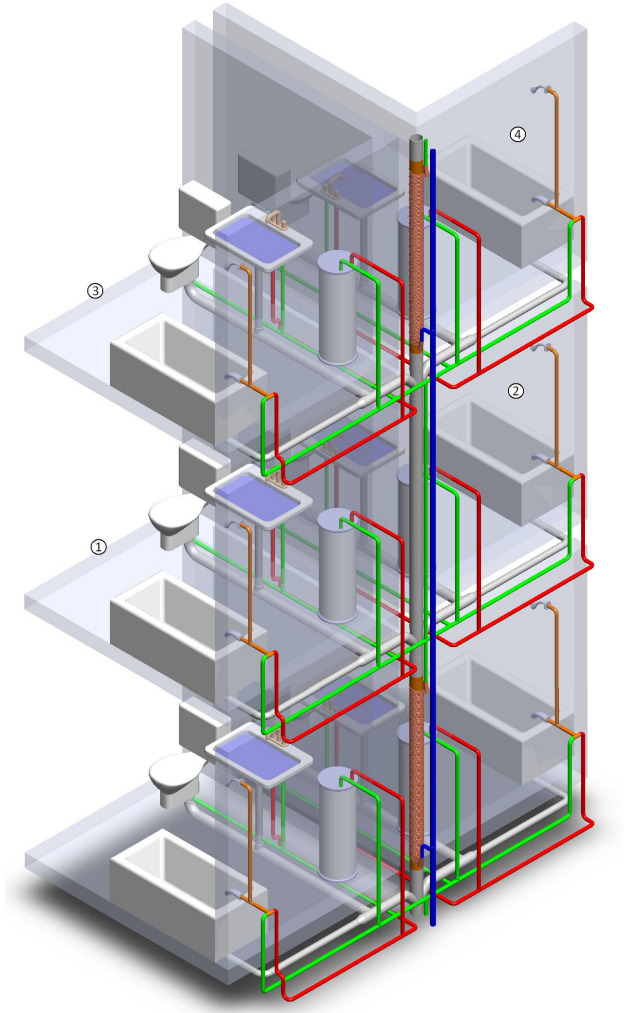
Equal Flow Pre-Heating

- Maximum energy savings from DWHR with the equal flow plumbing scenario

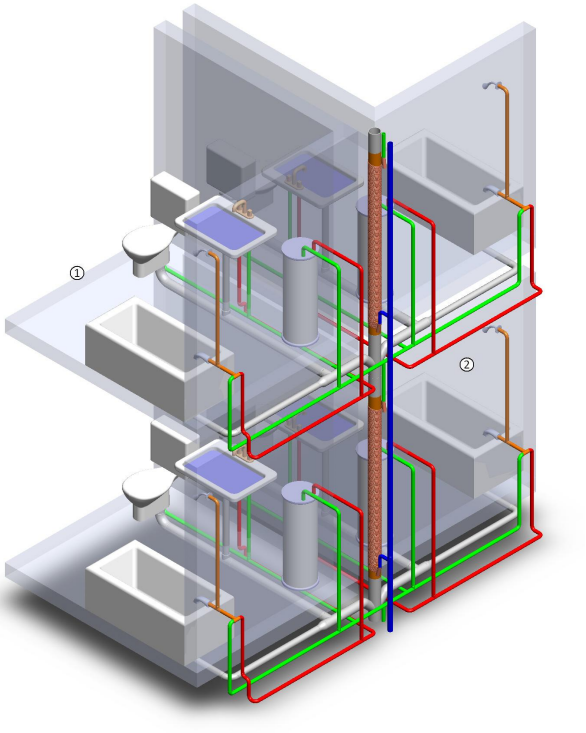
<u>Apartment Buildings and Condos</u>

- HUGE SAVINGS: Each apartment or condo ought to have its own water heater so user pays for consumption
- One scenario: small tank (20-30 gal) off-peak electric water heating installed with DWHR unit with little risk of running out of hot water

Equal Flow Arrangement



4 WC Equal Flow arranged 2 by 1



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Equal Flow Pre-Heating

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	3-4 WC per DWHR Unit	**Equal Flow with 1.5gpm Showerheads**		**29.8%**	**6.7%**	**3.3**	**6.7**	**$350.00**
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	>=7 WC per DWHR Unit	recirc. loop / custom engineered		4.1%	1.3%	0.6	1.3	custom

Typical Energy Savings: 6% to 9%

Typical Budgetary Cost: $260 to $580 per suite

Typical Payback Range: 4-6 years

Commercial Applications

- Overview
- Recreational facilities; High school; Prisons
  - A) Gravity fed DWHR units
  - B) Slab-on-grade case
  - C) Choosing a pump
- Food Services
  - A) Dishwashers applications
  - B) DWHR system configuration
  - C) Examples –
    - DWHR with falling drain flow
    - Multi-pipe DWHR unit
    - Direct pumped drain flow
    - Drain water storage and pumping
- Laundry Facilities

Commercial Applications - Overview

- Many types of commercial applications for DWHR
- Expected return on investment of 30% to 200%

Application	Variation	Plumbing Configuration / Comments	Typical Hot Water Energy Load (% of total) A	Typical Reduction in Hot Water Load B	Typical Potential Savings of Total Energy Load (% of total) A*B	Typical LEED Points Achievable for High-Rise (NC and Major Retrofit) Multi-Residential
Foodservice (e.g. Restaurants, Cafeterias, etc.)	Batch Dishwasher	Any Load Size - savings estimated	15.6%	31.5%	4.9%	2.5
	Continuous Dishwasher	2.5gpm - savings estimated		37.8%	5.9%	2.9
	Continuous Dishwasher	5gpm - savings estimated		42.2%	6.6%	3.3
Hospitals - Inpatient	1-2 WC per DWHR Unit	CW Pre-Heating Only	19.4%	29.4%	5.7%	2.9
	3-4 WC per DWHR Unit	CW Pre-Heating Only		23.5%	4.6%	2.3
	5-6 WC per DWHR Unit	Pre-Heating with 1.5gpm Showerhea		16.7%	3.2%	1.6
NOTE: DWHR from showers illustrated. Hospitals have other loads which DWHR can recover heat from at an even higher energy savings rate.						
Education (Locker Rooms in High School & Colleges)	Multi-pipe DWHR Unit	Equal Flow	7.0%	48.2%	3.4%	1.7
	Multi-pipe DWHR Unit	Equal Flow		44.4%	3.1%	1.6
NOTE: DWHR for locker room showers & cafeterias. Excludes dorms. Multi-pipe DWHR units are assemblies of 2, 4 or 8 standard units.						
Recreation Facilities	Multi-pipe DWHR Unit	Equal Flow	project specific	50.0%	project specific	project specific
Laundry Facilities	Multi-pipe DWHR Unit	Equal Flow	project specific	60.0%	project specific	project specific
Prisons	Multi-pipe DWHR Unit	Equal Flow	project specific	55.0%	project specific	project specific

Recreation Facilities, High Schools, and Prisons - Gravity fed DWHR units

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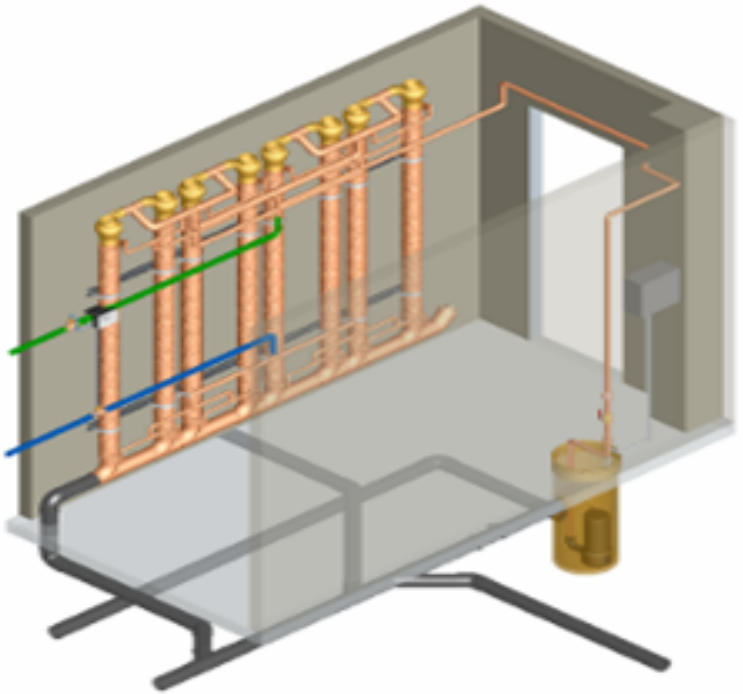
	Multi-pipe DWHR Unit	Equal Flow - C-series DWHR units		44.4%	3.1%	1.6
Recreation Facilities	Multi-pipe DWHR Unit	Equal Flow	project specific	50.0%	project specific	project specific
Prisons	Multi-pipe DWHR Unit	Equal Flow	project specific	55.0%	project specific	project specific

Gravity fed multi-pipe DWHR system

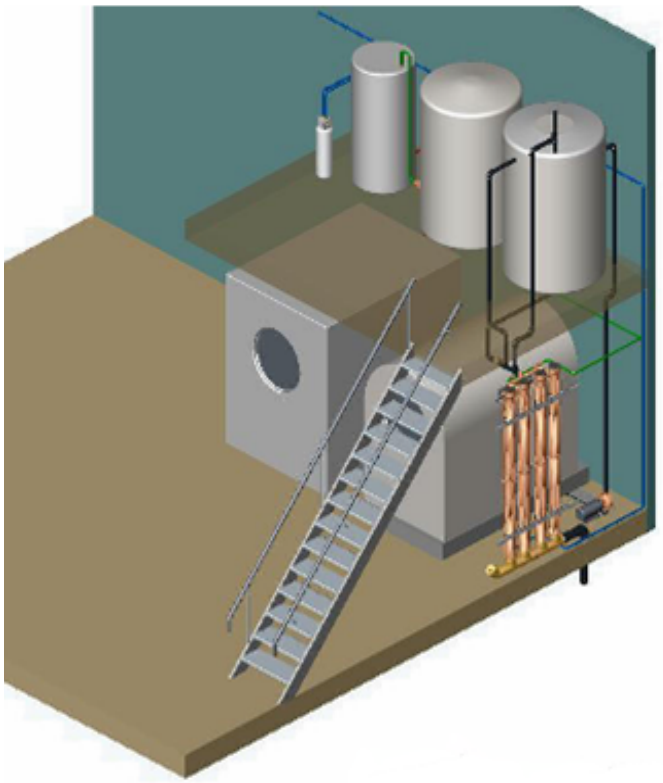
Slab-on-grade case

- slab-on-grade/drain flow in floor – elevate drain water using pump
- electrical consumption – only 1-2% of DWHR energy savings
- high schools/prisons - controller may not be required if showers are used all at once or not at all



Laundry Facilities

- drain water elevated and held in tank above
- drain water released to fall to heat exchanger during next hot water filling cycle



Dishwashers applications

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	Continuous Dishwasher	5gpm - savings estimated		42.2%	6.6%	3.3

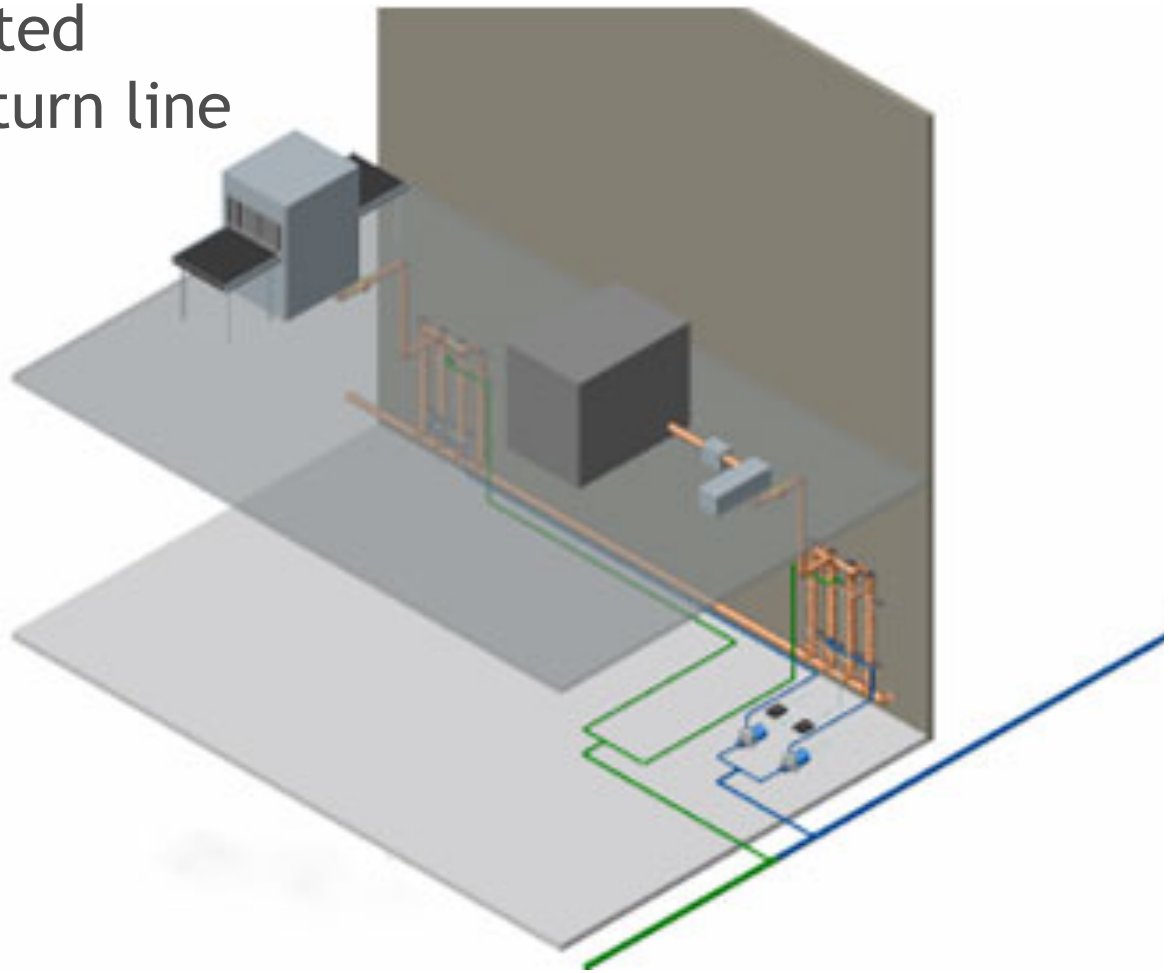
Typical Energy Savings: 5% to 7%, but can be double

Typical Budgetary Cost: $1,000 (gravity fed, single unit) to $15,000 (large hospital operation)

Typical Payback Range: 3-5 years

Examples - DWHR with Falling Drain Flow

- water heater located downstream of return line

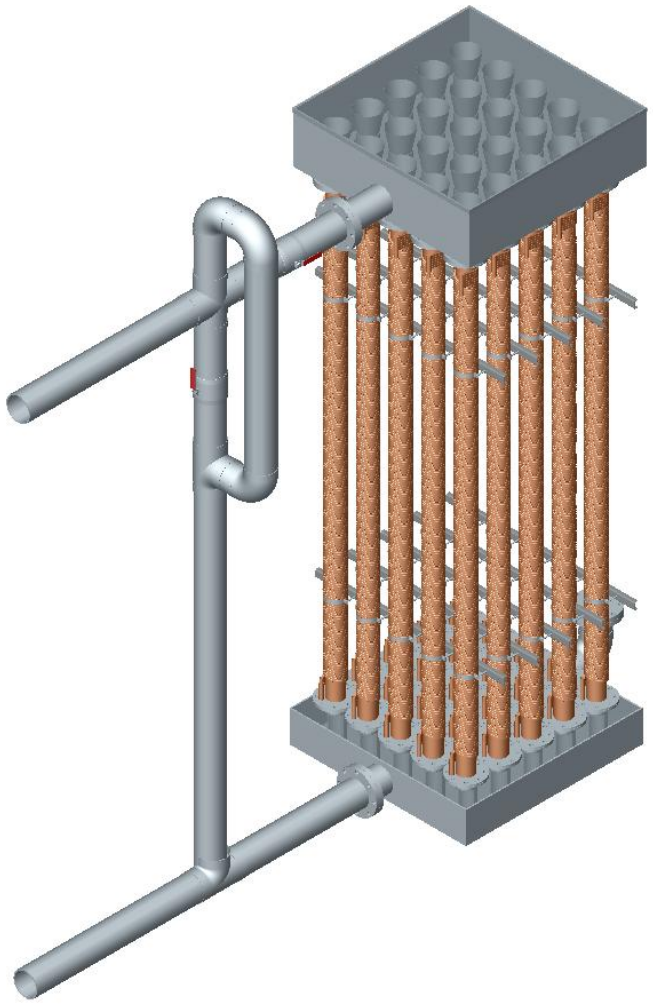


Examples - Drain Water Storage and Pumping

- batch dishwashers in slab-on-grade food services facilities – need drain water storage for next cycle

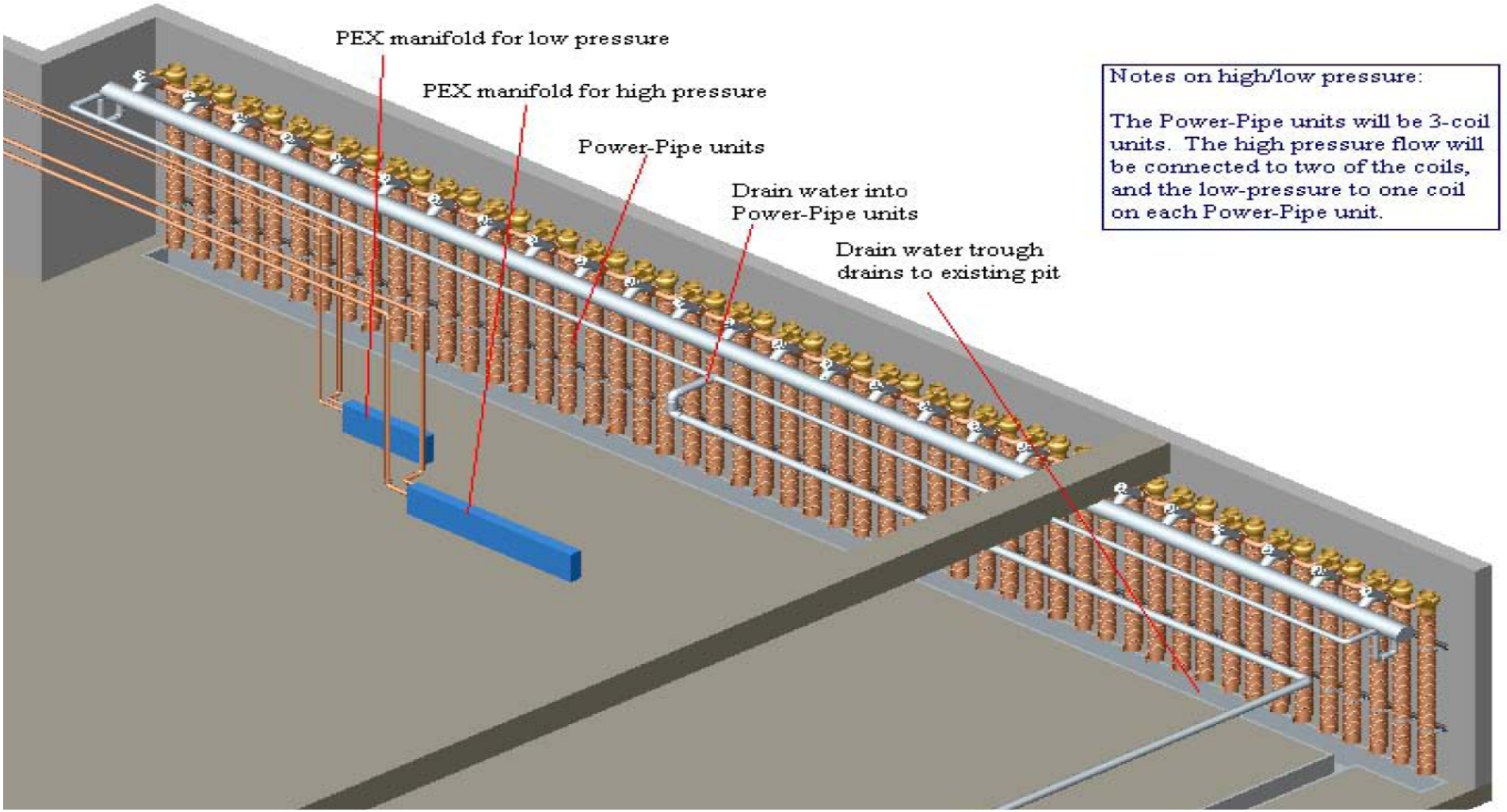
- drain water pumped to DWHR unit during next hot water filling cycle

Industrial: High Flows Require Larger Systems

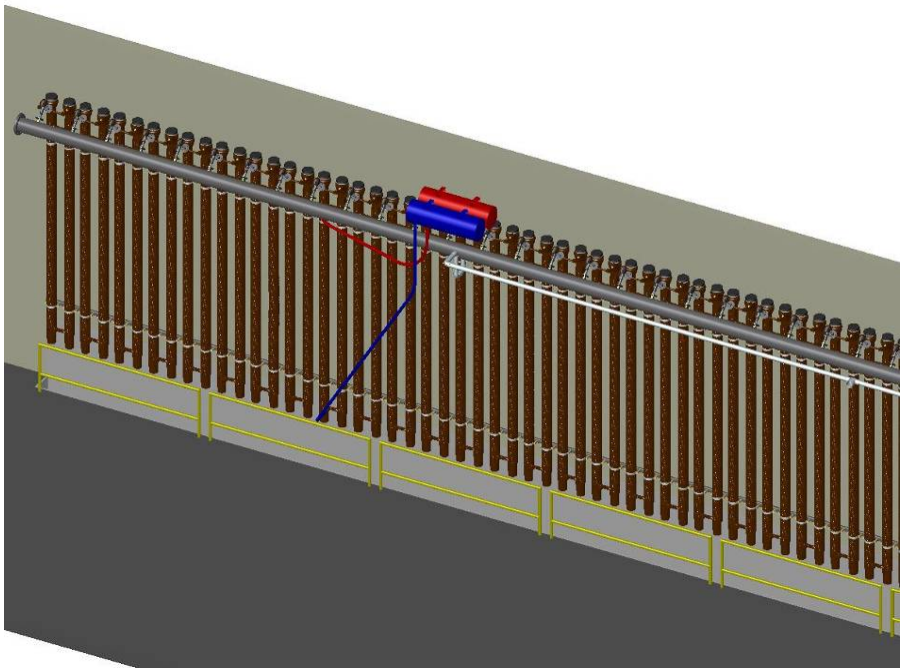


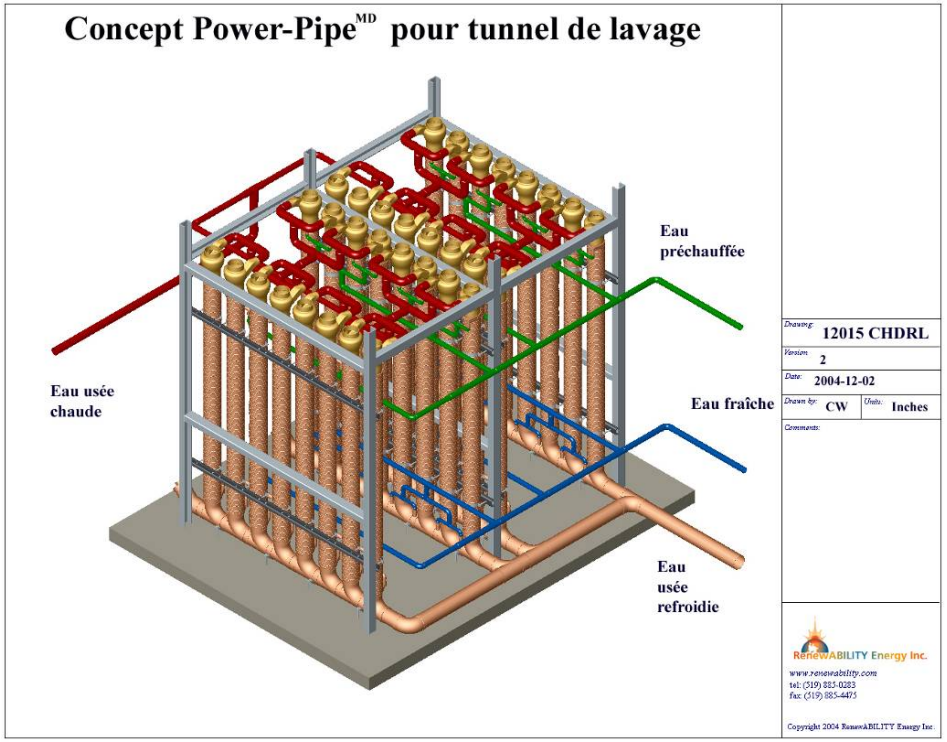
- Single Power-Pipe units do not perform well with large flows because:
  - The freshwater side will have huge pressure loss
  - The film on drain-side would be thick, resulting in low efficiency
- Manifolded units are used to splits large flows across multiple Power-Pipe units, ensuring low pressure drop and high efficiency
- Scalable for any size flow:
  - from 2 to 100,000 gpm
- Various designs depending on flow rates, space constraints, type of fluid, etc
- Systems are typically sized for 5–10 gpm per Power-Pipe

Industrial Sector Has Many Applications and ....



…. Modularity Provides Endless Design Options

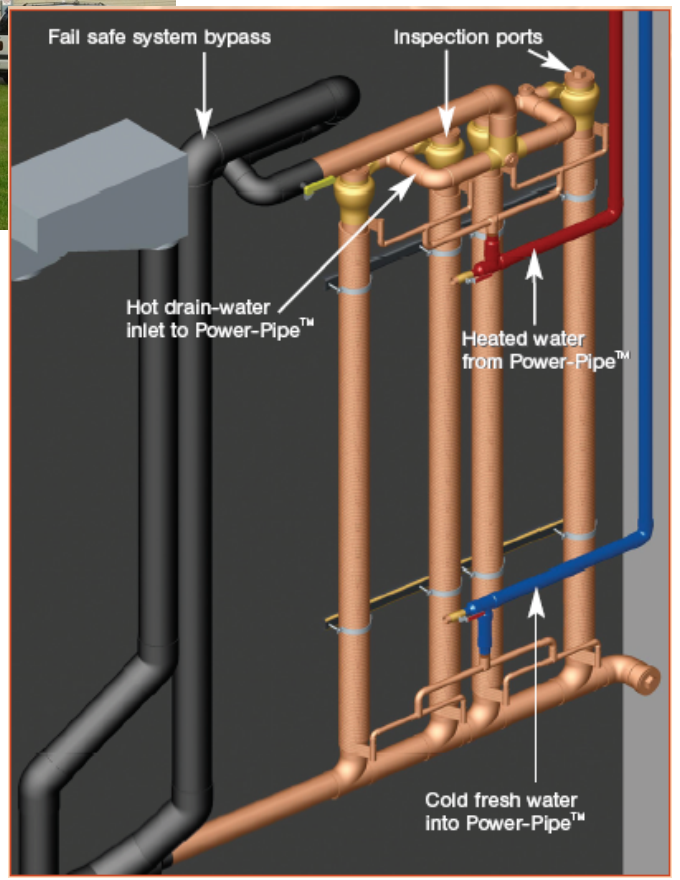




Industrial Example: Unilever Sauce Facility

The Power-Pipe®
Unilever system provides:

- 90% measured Return on Investment
- Zero Maintenance Operation (over 5 years)
- Increased hot water capacity, eliminating need for additional water heaters when expansion. Peak thermal power performance is above 300 kW
- Increased life to primary water heater due to reduced “thermal shock” because inlet temperature is much warmer with large washing operations
- Savings of 130 Tonnes CO_2 per year



Corrosive Drain Water is Not a Problem

- For hostile drain water Power-Pipe coated with a Heresite protective coating
- The appropriate coating is determined by Heresite based upon the constituents and quality (e.g. pH) of the drain water
- The coating process involves dipping and baking the Power-Pipe(s) multiple times until the specified coating thickness is achieved.
- The outside of the unit is also coated during the process; it will provide excellent protection against harmful vapors which are sometimes are in the air in an industrial facility.

Application Photo Collage

Market Challenge:

A Technology Stuck between Rating Systems

There is no EnergyStar

labeling program for DWHR because, by itself, it is an Energy Saving Device

What Should be Done?

1) Do nothing and limit energy saving opportunities for Americans

2) Create an EnergyStar label program

3) Create a different label/rating program

Test Procedures for Energy Factor are not well suited for DWHR + Water Heater

What Should be Done?

1) Do nothing and limit energy saving opportunity for Americans

2) Adopt Canadian Test Procedures and "Modified Energy Factor Calculation Method" and allow for labeling

3) Allow/Include in future EF test procedures for each type of water heater

Energy Factor Testing Example:

Standard Gas: EF = 0.58

With Power-Pipe R3-60: EF = 0.80

But, tank did not turn on during the first draw due to the high heat recovery from the Power-Pipe, causing difficulty with EF calculation

Canadian Calculation: EF = 0.87

Sampling of Various Programs and Energy Performance Building Code Recognition

Government of France – Building Code

Décrets, arrêtés, circulaires

TEXTES GÉNÉRAUX

MINISTÈRE DE L'ÉCOLOGIE, DE L'ÉNERGIE, DU DÉVELOPPEMENT DURABLE ET DE LA MER, EN CHARGE DES TECHNOLOGIES VERTES ET DES NÉGOCIATIONS SUR LE CLIMAT

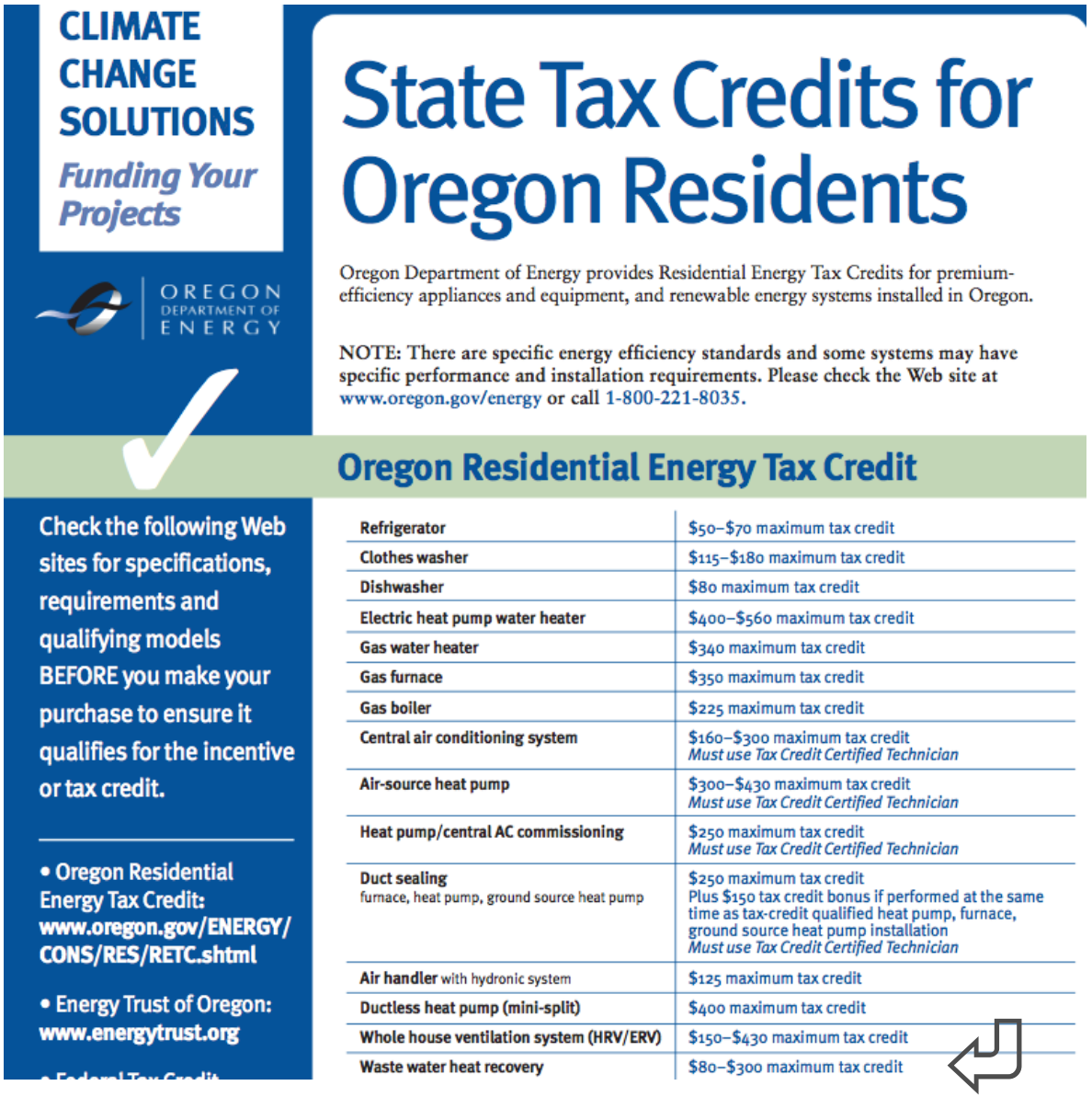
Arrêté du 14 octobre 2010 relatif à l'agrément de la demande de titre V relative à la prise en compte du système « Power-Pipe® » dans la réglementation thermique 2005

NOR : *DEVU1022036A*

Government of Canada – Retrofit and New Construct.

Drain-Water Heat Recovery Systems Eligible for Energy Credits	Full Credit (kWh)	Half Credit (kWh)
EcoInnovation Technologies (ECO-GFX)		
• S3-40 (75 mm/ 3 inch drain at 39% steady state)	1418	709
• S4-40 (102 mm/ 4 inch drain at 39% steady state)	1418	709
• G3-40 (75 mm/ 3 inch drain at 46% steady state)	1673	837
• S3-60 (75 mm/ 3 inch drain at 49% steady state)	1782	891
• S4-60 (102 mm/ 4 inch drain at 51% steady state)	1854	927
Watercycles Energy Recovery Inc. (Watercycles)		
• DX-4048 (102 mm / 4 inch drain at 44% steady state)	1603	802
• DX-3058 (75 mm / 3 inch drain at 42% steady state)	1529	765
Renewability Energy Inc. (PowerPipe)		
• R3-30 (75 mm/ 3 inch drain at 32.9% steady state)	1194	597
• R3-36 (75 mm / 3 inch drain at 37.9% steady state)	1378	689
• R3-42 (75 mm / 3 inch drain at 42.4% steady state)	1544	772
• R3-48 (75 mm / 3 inch drain at 47.3% steady state)	1725	863
• R3-54 (75 mm / 3 inch drain at 49.2% steady state)	1795	898
• R3-60 (75 mm / 3 inch drain at 53.7% steady state)	1961	981
• R3-66 (75 mm / 3 inch drain at 55% steady state)	2009	1005
• R3-72 (75 mm / 3 inch drain at 58.8% steady state)	2149	1075
• R3-120 (75 mm / 3 inch drain at 67.7% steady state)	2478	1239
• R4-24 (102 mm / 4 inch drain at 31.5% steady state)	1142	571
• R4-30 (102 mm / 4 inch drain at 40.4% steady state)	1470	735
• R4-36 (102 mm / 4 inch drain at 42.4% steady state)	1544	772
• R4-42 (102 mm / 4 inch drain at 46.1% steady state)	1681	840
• R4-48 (102 mm / 4 inch drain at 52.7% steady state)	1924	962
• R4-54 (102 mm / 4 inch drain at 54.7% steady state)	1998	999
• R4-60 (102 mm / 4 inch drain at 58.4% steady state)	2135	1067
• R4-66 (102 mm / 4 inch drain at 59.9% steady state)	2190	1095
• R4-72 (102 mm / 4 inch drain at 62.9% steady state)	2301	1150
• R4-120 (102 mm / 4 inch drain at 72.2% steady state)	2644	1322

State of Oregon Tax Credit – for over 10 years



CLIMATE CHANGE SOLUTIONS

Funding Your Projects

OREGON DEPARTMENT OF ENERGY

Check the following Web sites for specifications, requirements and qualifying models BEFORE you make your purchase to ensure it qualifies for the incentive or tax credit.

- Oregon Residential Energy Tax Credit: **www.oregon.gov/ENERGY/CONS/RES/RETC.shtml**
- Energy Trust of Oregon: **www.energytrust.org**

State Tax Credits for Oregon Residents

Oregon Department of Energy provides Residential Energy Tax Credits for premium-efficiency appliances and equipment, and renewable energy systems installed in Oregon.

NOTE: There are specific energy efficiency standards and some systems may have specific performance and installation requirements. Please check the Web site at www.oregon.gov/energy or call 1-800-221-8035.

Oregon Residential Energy Tax Credit

Refrigerator	$50–$70 maximum tax credit
Clothes washer	$115–$180 maximum tax credit
Dishwasher	$80 maximum tax credit
Electric heat pump water heater	$400–$560 maximum tax credit
Gas water heater	$340 maximum tax credit
Gas furnace	$350 maximum tax credit
Gas boiler	$225 maximum tax credit
Central air conditioning system	$160–$300 maximum tax credit *Must use Tax Credit Certified Technician*
Air-source heat pump	$300–$430 maximum tax credit *Must use Tax Credit Certified Technician*
Heat pump/central AC commissioning	$250 maximum tax credit *Must use Tax Credit Certified Technician*
Duct sealing furnace, heat pump, ground source heat pump	$250 maximum tax credit Plus $150 tax credit bonus if performed at the same time as tax-credit qualified heat pump, furnace, ground source heat pump installation *Must use Tax Credit Certified Technician*
Air handler with hydronic system	$125 maximum tax credit
Ductless heat pump (mini-split)	$400 maximum tax credit
Whole house ventilation system (HRV/ERV)	$150–$430 maximum tax credit
Waste water heat recovery	$80–$300 maximum tax credit

Minnesota Power

minnesota power
AN ALLETE COMPANY

Minnesota Power proudly serves 144,000 electric customers in Northeastern Minnesota and Northern Wisconsin.

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power of one
it begins with you

one home | one business | one community

MP Home > Power of One > One Home > Water Heating > Water Heating: Save Energy, Save Water

Water Heating: Simply Save Energy, Save Water and Stop Wasting Money

Drain Water Heat Recovery (DWHR)

DWHR Rebate | Program and Product Trained Installers | SmartPak | Water Heating Info | Found Money | DWHR Calculator | Why DWHR?

one home

- What You Can Do at Home
- Energy Saving Tools & Info
- Rebates & Savings
- Lighting & Appliances
- Heating and Cooling
- Water Heating
- Home Improvements
- New Construction (Triple E)
- Renewable Energy Options
- Minnesota Loan Programs

Water heating is one of the largest energy expenses in the home, accounting for about 15–25 percent of residential energy costs. Yet, **90 percent of that heat goes right down the drain**, costing you energy and money. Drain Water Heat Recovery (DWHR) technology can reduce water heating costs by up to 40 percent. This electric energy savings in turn translates into a reduction in greenhouse gas emissions by up to one ton per year.

"There are a hundred different ways to spend money trying to save energy, but this is simple and the payback is quick."

Jay Zierden
Triple E home builder

IN THE FIELD

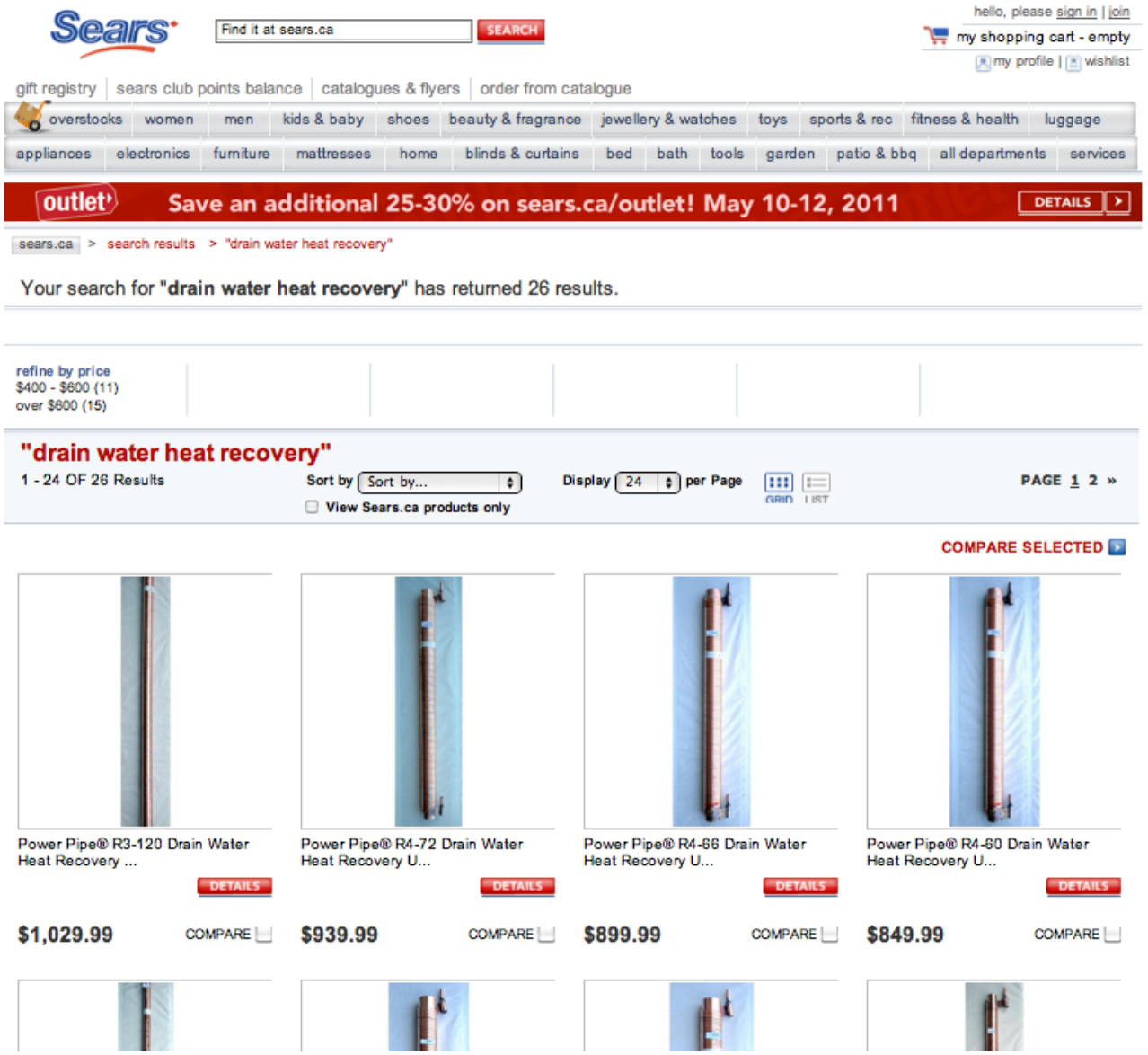
Installing DWHR in Existing Homes

"DWHR units are relatively easy to install. You know they work right after you put them in. Turn on the shower and you can feel nice tempered water going to the hot water tank. They reduce wear and tear on the water heater and there are no moving parts, so they are virtually maintenance free. I feel they are a worthwhile investment."

Glen Nordquist, Plumber, Carlson Duluth Company

Click here to read the *Building Up Newsletter* on **Drain Water Heat Recovery**

Sears Canada



Some Other References

Government of France:
http://www.rt-batiment.fr/fileadmin/documents/RT2005/titre_V/Arrete_Titre_V_14_octobre_2010_Power_Pipe.pdf

Government of Canada:
http://oee.nrcan.gc.ca/residential/personal/retrofit-homes/drain.cfm?attr=4

Minnesota Power:
http://www.mnpower.com/powerofone/one_home/waterheating/dwhr/

U.S. DOE:
http://www.energysavers.gov/your_home/water_heating/index.cfm/mytopic=13040

Sears Canada

- http://www.sears.ca/stores/shop/search?langId=1&storeId=10051&catalogId=10001&N=0&Ntk=level1&Ntt=drain+water+heat+recovery&Nty=1&D=drain+water+heat+recovery&Ntx=mode+matchall&Dx=mode+matchall&initialquery=true&internalSearch=true

Home Depot Canada:

- http://www.homedepot.ca/catalog/drain-water-heat-recovery/173006

Top 10 Reasons: Why Builders Include and Like the Power-Pipe

- It is a low-cost technology for credits in energy efficiency labeling programs (e.g. LEED, ENERGYSTAR for New Homes)
- It is cost-effective for single homes and multi-residential buildings adding little to a mortgage while saving customers up to 30% or more (depending upon unit size) on water heating costs
- Demonstrability: It is one of the most obvious and visible energy saving technologies that a builder can showcase. People can even feel the heat pickup on the unit when hot water runs down the drain
- Positions them as innovative and environmentally aware
- Strengthens reputation as a leading builder
- Triples effective hot water capacity
- Reduces greenhouse gas emissions
- Maintenance free with no moving parts
- Will increase the life of the water heater
- Easy to install

Review and Summary

- DWHR advantages:
  - Practical and proven in many applications
  - Easy to specify and install
  - Cost-effective
- Performance includes 2 factors:
  - Efficiency at nominal flow rate
  - Pressure loss at maximum flow rate
- DWHR should be:
  - Considered a standard appliance
  - Incorporated wherever possible

136 Ottawa St. S. - Unit #3
Kitchener, Ontario, Canada N2G 3S9

Drain Water Heat Recovery Systems

Questions

There is now time for Product Specific Questions and Discussion

www.renewability.com